AMRAD NEWSLETTER

Amateur Radio Research and Development Corporation January 1982

OUR JANUARY 4 MEETING will feature a talk by George Lemaster on various TV captioning systems, including those for the deaf. George is associated with public broadcasting and is familiar with the different schemes currently being debated. We will have a sign-language interpreter there. So please invite your deaf friends.

THE FEBRUARY 1 MEETING will be on the subject of spread spectrum experimentation. We will review the work done to date by the AMRAD Spread Spectrum Special Interest Group (SSSIG). It would be a good idea for you to reread the FCC Notice of Inquiry and Proposed Rule Making, General Docket No. 81-414 in the November issue of the newsletter.

AT OUR DECEMBER 7 ANNUAL MEETING three directors (for two-year terms) and two alternates (for one-year terms) were elected to office. Here are the results:

Terry L. Fox, WB4JFI	Director
Paul L. Rinaldo, W4RI	Director
Elton A. Sanders, WB5MMB	Director
Richard Barth, W3HWN	Alternate
David W. Borden, K8MMO	Alternate

Dick Barth recapped the story of HEX, the Handicapped Education Exchange. He also talked a bit about the termination of DEAFNET which is scheduled to take place on January 15. For those of you who do not know, DEAFNET is not a generic term for deaf TTY or TDD communications. It is a specific network set up by SRI International under a contract from the U.S. Department of Education. DEAFNET originally had three major nodes -- Washington, DC; San Francisco; and, Boston. Boston had already peeled off and is currently using Telemail to tie their users together. DEAFNET will definitely be missed by those who depended on it for communications. We are planning to use HEX to pick up some of the slack. Dick attended a special meeting on this subject at Gallaudet College in December and will keep us informed on developments. In any event, we will be trying to do what we can to work with Telecommunications for the Deaf, Inc. and the other individuals and organizations.

THERE WAS A TYPO IN NEW DUES RATE in last month's newsletter. The rate for second in the family should have read $8 per year (not $6). As a result, those wishing to take advantage of the old ($6) rate are given an extra month's grace, i.e., through the end of January.

THIS ISSUE OF THE AMRAD NEWSLETTER is being typed in the old-fashioned way -- using an IBM Selectric typewriter. The process also includes copious amounts of white correcting fluid and time for it to dry between typos. I had hoped to graduate to a computerized word processor by now but have had some troubles with my Diablo Hy-Type I ASCII printer. Conversion to computer wp will take place as soon as possible after hardware problems are solved and I get on top of WordStar. At some point, authors of articles and columns will be able to send in material via telephone line or by CP/M 8-inch disk. Probably the first one to do so is Dave Borden who is ready to go as soon as I have my computer problems licked. P.s., who likes to work on Diablos?

THE COMPUTERIZATION OF MAILING LABELS took place with very few hitches, starting with the last issue. Bill Pala, WB4NFB has developed a very comprehensive data base program that will produce mailing labels, membership directories, etc. Yes, that means that an AMRAD membership directory is in the works soon.

Please look at your mailing label to see if everything is correct. If not, please report any changes to Bill Pala ASAP. Use the application form in the back of the newsletter to report changes. Also, check the label for the word "RENEW." If you see it, that means that our records show that your dues have expired. We're not so bold as to claim 100% accuracy, so please let Bill know (gently) of any discrepancies.

(continued on page 8)

PROTOCOL

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NEWS

Jon Bloom, KE3Z, has written a Magnuski-style repeater program that runs in one PROM on the VADCG TNC board. This means that anyone who desires to run a packet repeater can just use the standard TNC board, Bell 202 modem, standard 2-meter fm rig and one of these PROMs. The code is available free from AMRAD, but there will be a two-dollar media fee for paper copies to cover postage, paper, etc. Magnuski-style means that the code follows the algorithm designed by Hank Magnuski, KA6M, in use on his San Francisco repeater (146.580 MHz).

Two of these repeaters are available in this area. The first is WB5MMB/R located in Vienna, VA at Sany's house. It will soon be operational on frequency 147.585 MHz. The other machine is K8MMO/R which is operational in Waldorf, MD on frequency 146.595 MHz. These two frequencies are chosen to be in no-man's land between ARRL simplex frequency declarations and those for repeater inputs and outputs.

A third AMRAD repeater is soon to be operational in Oakland, NJ (WB2SNA/R). This machine will operate on a frequency of 145.985 MHz and be accessible to the ever-growing New Jersey gang. I have shipped them a PROM, and it should be on the air soon.

Steve Robinson, W2FPY, of Ringwood, NJ is trying to organize the backbone network of the New York/New Jersey area. He has lined up various ill-used 220-MHz repeaters to use and has secured a large number of TNC board orders. The New Jersey activity includes:

Oakland, NJ - K2BJG has suggested using the local 223.34/224.94-MHz machine on packet and support for a local area network is growing.

Holmdel, NJ - AD7I and friends are developing their own modem and TNC board, compatible with the HDLC protocol, but placing emphasis on elaborate self-testing and diagnostics. They are eager to join the backbone network.

Pluckemin, NJ - K2TKN has agreed to join the Cherryville Repeater Association's hardware to the backbone network.

Trenton, NJ - WB2LTW is building a simplex packet repeater as his senior project. Steve is helping him wherever possible.

Indian Mills, NJ - KA2BQE wants to operate a packet repeater in his area (south of Steve). I have agreed to burn him a PROM, and he already has constructed a TNC board and is on packet.

As the gang in New Jersey forges ahead, the hams in Arizona, led by Den Connors, KD2S, have not been sleeping. They have designed a TNC board using the Western Digital 1933 protocol controller chip and a 6502 microprocessor. They have promised to ship us a schematic and prototype board soon. We are all looking forward to this project with great anticipation. In previous columns, I have mentioned the 1933 chip as the only other alternative to the 8273 chip in our NRZI-encoding DPLL scheme. It is also cheaper, always a point to consider.

Terry Fox, WB4JFI, has complated the S-100 station node controller board and is debugging it and crafting some software. The first software will have the board acting as a normal TNC to gain experience with the hardware and what it will do. Paul Rinaldo, W4RI, is trying to make a case for doing a single S-100 board TNC using Terry's basic design. I am attempting to make a case for a new TNC board design using a Z80 and the 1933 chip that Den is using. In either case, Terry is moving right along on his projects.

LOCAL AREA NETWORK CONSIDERATIONS

In the local area network environment, it is easy to implement a scheme, which we have done, to assign hard-coded addresses to each user possessing a TNC board. This scheme has two immediate advantages:

1) Direct communication in the connect mode is possible anytime without the requirement for a smart local area repeater/node to establish the connection.

2) Slight address modification (setting one bit can be affected whenever a local user decides to make use of the local area repeater.

The problem with simple schemes like that is that only a fixed number of addresses (254 or so) is allowed and that a local area coordinator is required to assign these addresses in a coordinated manner. If a local area Magnuski-style repeater is implemented, the number of addresses drops to 62 or so (usually FF hex and 00 are reserved). Forgetting the larger national network with its attendant link nodes for a moment, an immediate problem arises, that of what to do about "visiting firemen" or area newcomers who bring their TNC boards from another local area network to ours. Their address that comes with them is bound to conflict with those addresses we have already assigned.

The founding packet fathers have already thought of this and implemented a scheme where a "station node" is required for local users (really anyone) to communicate. Everyone signs on the station node with address 00 in Doug Lockhart's scheme, and the station node assigns the user a dynamic address which the user uses for the duration of his time on the local area net. How do users desiring direct (non-station-node) connection on a simplex frequency get together in that scheme? Both will have address 00, which will not work. Let us suggest a scheme.

One possibility is to have the two users sign on the station node and get a unique address assigned and then go off and use the supplied address to communicate. The problem here, as pointed out by Hank Magnuski, is that of positive deallocation. The purpose of signing on the station node in the first place was to obtain a unique address which is not in use by any other packet user. That means that once the station node assigns the two addresses to our simplex, non-station-node-connection users, the addresses must be entered into a table and not assigned to newcomers to the station node. Picture our two users off on some simplex frequency communicating for house. When they are finished, they just shut down. The station node is stuck with two addresses allocated and cannot reassign them. If the station node did reassign the addresses to new users, who then ran over to the same simplex frequency, our previous users are still on and communicating, all havoc will break loose for our previous connection. Perhaps the answer (depending on how many packet users are in a local area) is to deallocate the address after some fixed time such as six hours.

In the commercial software world, we do not begin a project by coding as we do at home in the ham shack. We begin by listing the requirements and getting the customer to agree on them. In our packet network there are no customers, really, and the founding packet fathers have to agree on the requirement. That's difficult. Let's begin our thinking about this problem by listing some requirements from Hank Magnuski. We at AMRAD do not agree with all these requirements, but they are useful for discussion:

1) Consider multiple repeaters on the same frequency with overlapping rf domains. Duplex machines will not work. Repeaters, links and users are all on the same channel.

2) No single control station should be in charge.

3) User stations should be able to move into an area and start transmitting without any prearranged address assignment or placement on a polling list.

4) Long-term assignment cannot depend on permanent assignment of HDLC addresses. The call sign is all that is really important.

5) Users should have some control over which repeater they access or none.

6) Direct connects must be permitted.

7) Target stations (of a contact) should automatically adjust their output to return packets via the repeater or non-repeater path initiated by the connecting station.

Hank goes on for a total of some 27 points of requirement. A large number of points deal with the interlinking of repeaters using the ARPANET (or NBS) Internet header. I will save those points for next month and a discussion on repeater (local area station node) linking.

This month's discussion, in summary, has covered the local area node addressing problem. Simply stated, without discussing the interlinking of repeaters, the problem centers on hard coding the addresses assigned to the ultimate end users of the network (people with TNC boards) or not. Terry Fox has another idea. He suggests that we use the address extension field(s) of the HDLC protocol to extend our address to seven bytes (enough to hold a call sign). This meets requirement four of Hank's, above, and is a really hard point to overlook. The Amateur Radio call sign is unique and all that is really important. It no longer maps to even call area (I do not live in Michigan, Ohio or West Virginia), but there is no other K8MMO (good thing, too). Most all of our current scheme can stay intact by just extending the address field. I cal still set a bit to ask to be repeated or not. I still think, however, that if you show up on a packet repeater frequency you should be repeated. If you run simplex there, then you are lowering the throughput of the people on the channel going through the repeater. If you want direct simplex, go off on some direct simplex frequency. That is exactly what you would do in voice.

Next month we will discuss repeater linking, another popular subject to cause discussion among packeteers. □

SPREAD SPECTRUM

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FEBRUARY AMRAD MEETING

The February AMRAD meeting will be devoted to reviewing the activity of the spread spectrum SIG. As you know, March is the month that the STA will expire, and we are required to report to the FCC on the activities carried out under the spread spectrum STA.

Specific items that will be reviewed at the meeting are the completed experiment number one (hf frequency hopping) and experiment number five (vhf frequency hopping). Progress on experiment two (10-meter frequency hopping) is at the construction phase. We are looking forward to activity for experiment number three which is the first crack at direct sequence spread spectrum.

As you can see, most of our spread spectrum activity has been with frequency hopping which seems to be technologically more intuitive than direct sequence and perhaps somewhat easier than direct sequence.

All members of the spread spectrum STA are urged to attend this meeting and get in their two cents worth. We are also planning for a second STA which will be used to carry forward the work started in ten-meter frequency hopping and the 420-MHz direct sequence work.

SELF ENFORCEMENT

Self policing has been a traditional aspect of ham radio, but it faces some unique challenges with the introduction of new technologies. Both spread spectrum and packet are examples of nontraditional amateur communications modes which are not "decodable" on a conventional receiver system.

The STA group at AMRAD has received a number of comments about self policing of spread spectrum and feels that it is a valid point. The inability of a third party to monitor a spread spectrum transmission rests on knowledge of certain signal characteristics. If there is no knowledge of these signal characteristics available, then the job of trying to receive the spread spectrum signal is quite complex and requires both special training and special equipment.

To consider this point, a subgroup of interested parties within the SSSIG was set up to deal with this aspect of SS modulation. The purpose of the group is to devise a cost effective way that a "general purpose" spread spectrum receiver could be developed for the vhf amateur bands.

So far the group has been considering simple frequency hopping in the 220-MHz band as a model. The technique for receiving the frequency hopped signal without knowledge of the pseudorandom (PN) hopping sequence rules out anything like a "smart scanner" receiver as estimation of the PN sequence is quite difficult and usually requires a computer process for reconstructing the PN generator equation from some captured samples.

A second approach which seems more promising is to avoid the PN estimation problem by going to a wideband compressive receiver. There are two aspects to this technique. First is the fact that a frequency hopper will always be in a given band (for amateur applications). If no other signals are present in the band but just the frequency hopper, then by "compressing" the band down so that the compressed version is about the bandwidth of conventional fm will "focus" the frequency hopper signal right around a single frequency.

A compressive receiver is ually implemented as a very very fast scanning receiver. The scanning starts at the low end of the band and tunes upward toward the top of the band. This takes place over and over again at a very fast rate. The output from this receiver is at the i-f frequency and has a resultant bandwidth of the receiver i-f.

If only a frequency hopping signal is present then the scanning will always encounter it at some place within the bandpass. This will then be translated to the receiver i-f by standard receiver action. Because in this example the only signal

present is the frequency hopper, it will be continually present at the receiver i-f.

Notice that this approach is useful for negating the effects of the PN hopping sequence. The PN code selects a new random discrete frequency for each hop which the system makes. By receiving every frequency within the range of possible hopping, the compressive receiver doesn't need to know the PN code.

The second step that is required is to throw away all signals which do not act like frequency hopping signals. This can be done by designing a window function which tosses out all signals which are present for longer than the dwell time of the frequency hopper and all signals which are significantly shorter than the dwell time. Both these signals will be things other than the frequency hopper signal.

This filter was dubbed a "time window," and at present the SIG subgroup is looking for an analog implementation. This time window filter is used to isolate the frequency hopping signal from interference before it is compressed by the compressive receiver.

The time window filter has a simple computer implementation and is currently part of a computer signal processing application. The trick is to get a low-cost purely analog approach to this.

AO FOR THE FUTURE

A major advance just over the horizon should make treating spread spectrum much easier. This is the field of acousto-optics (AO). This technology combines lasers, ultrasonics and microelectronics to produce some truly astounding devices.

AO techniques are based on the fact that when laser light passes through a lens system, the resulting diffractions can be described by transform mathematics. It turns out that transform mathematics is also used to describe what electronics does to a signal.

This happy fact allows us to modulate a laser beam and do very complicated processing by passing the beam through appropriate lenses. If a picture is placed in between the laser beam and the lens, the laser beam will take on the characteristics of the picture. This allows the picture to be processed by the lens system.

When a picture is processed by a computer (as NASA does) it is divided into pixels or picture elements. Many pictures have up to a million pixels in them. This represents a very large processing load for a computer, especially if there is a backlog of pictures that must be processed. Pictures are usually treated with complex processes as well which further increases the load.

The laser and lens system can do tha same processing, but the lens does it with all the pixels at the same time! This means that results are obtainable almost at the speed of light.

The acoustic connection comes from an effect known in physics as the Bragg effect. Here if a lens is put under a varying presure, the laser beam will be refracted such that the beam will break up into sub-beams with one for each spectral component of the presure function.

An ultrasonic transducer (really a kind of speaker) can apply force by sound waves. If a transducer is attached to the lens and then a modulated voltage is applied, the lens will be subject to pressure at the modulating frequency. The result is that the laser light will break up and show the harmonic content of the modulating voltage.

What we have constructed here is a very versatile spectrum analyzer. Input to the spectrum analyzer is to the lens transducer. The output is taken from a light-sensitive array on which the laser beam shines. Each cell of the light-sensitive array represents a different frequency.

This device is called a Bragg Cell and has been implemented in one case to be a spectrum analyzer/receiver which received the entire band from 0 to 500 MHz at the same time! The resolution of the device is around 10 kHz. The output was put on a scope which displayed both the component and its amplitude, much as a conventional spectrum analyzer does.

Spread spectrum techniques will be greatly affected by this revolution in laser technology which seems geared for the present to meet the challenge of frequency-agile and low-probability-of-intercept (LPI) systems which are now in practice.

EXPERIMENT #5

Paul Rinaldo, W4RI, has handed the FCC an amendment to the STA. This experiment is for Chuck Phillips' mobile frequency hopping system in the two-meter band. The experiment calls for tests between different places in the Washington, DC and Annapolis, MD areas, including some ship-shore and ship-ship communications.

The frequency hoppers run up to 80 hops per second on a preset bank of channels which is variable in number but fixed for each test. Normal power for most tests will be 25 watts, but tests will include some long-range tests using up to 125 watts.

Those stations included in the STA amendment request are N4EZV, W4RI and WB3KDU.

From preliminary dummy load testing, very promising results are anticipated from the proposed on-the-air tests. □

Digital Signaling Schemes for Amateur Radio

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Paul Rinaldo, W4RI, made some interesting comments regarding the types of modulation and data rates that might be best for Amateur Radio digital communications in his paper at the 1981 ARRL Amateur Radio Computer Networking Conference.[1] I would like to add some of my own comments to that discussion. I will only be considering forms of fsk (frequency-shift keying) and psk (phase-shift keying).

HF

At hf we have a significant problem with multipath propagation -- which causes fading. We know that an fsk system has potential to provide some relief from this problem, and I think it is therefore the logical choice at hf (as opposed to psk). Next we need to consider the amount of shift and signaling speed.

As discussed in Ref[1], the effects of multipath limit the maximum signaling speed that can be used with acceptable error rates. My interpretation of the available information is that 400 to 600 bits/s is probably a good compromise for an hf digital standard.

To use these speeds (reliably) we need shifts of 400 to 600 Hz. I think that we should retain compatibility with the existing commercially available excellent quality RTTY demodulators, even if we choose to add some outboard enhancements latter -- rather than adopting a standard that requires all new equipment. So we are now limiting ourselves to 170, 425 or 850 Hz shifts. Although 850 Hz shift would be excellent for multipath, I think that it is too wide to recommend for the crowded hf bands. We can run at 150 bits/s with 170 Hz shift, for a narrow signal with reduced multipath immunity, and we can also run up to about 400 bits/s at 425 Hz shift with improved multipath performance (relative to 170 Hz shift).

I am recommending two shifts and three signaling speeds as hf digital "standards": (1) 400, 150 and 75 bits/s at 425 Hz shift as "primary" (with an FCC rules change required for 400 bits/s at hf and (2) 150 and 75 bits/s at 170 Hz shift as "secondary." When band crowing is not serious, 425 Hz shift would be preferred, and choice of signaling speed could be traded off for noise immunity. Under crowded or very noisy conditions, 170 Hz shift would be preferred, with the choice of speeds depending upon how "bad" conditions were (slower speeds being, in general, more reliable under degraded conditions).

To make use of frequency diversity in reducing multipath fading, we will need to devise techniques to combine the two channels in some effective way. I am not proposing any particular technique -- although we should come up with something.

We can also (theoretically) gain about 2 dB in signal-to-noise performance by coherently detecting the fsk signsl rather than using the normal envelope detection process. This would require more complicated demodulators, however, and may not be worth the effort.

We also have the issue of asynchronous vs synchronous formatting of the data itself (with or without start and stop bits). In my opinion, at hf where we can expent frequent loss of synchronization, we are better off staying with asynchronous data and avoiding the added complexity of data receivers that can derive their clocking from the data stream. (It's a different story at vhf and uhf, though).

VHF AND ABOVE

Above 144 MHz the radio channel becomes much better behaved. Noise levels are generally lower and steadier, and severe fading is not such a problem. Since frequency diversity is no longer particularly useful, we should consider psk.

A psk signal is "trickier" to tune in than an fsk signal, and the demodulator is considerably more difficult to build and align than a comparable unit for fsk. It is possible, however, to get a higher signaling rate and better error performance in a given signal bandwidth with psk than with fsk. Once we choose psk, which operates synchronously anyway, it is only reasonable to format our data synchronously as well.

I feel that the scheme we adopt should be compatible with existing fm and ssb vhf/uhf rigs. There is probably a use for very wideband, high rate data channels (like 56 kilobits/s) within a computer network, but right now these would require very sophisticated modems and custom-built wideband radios. I think that this will remain the realm of the sophisticated experimenter for a while, and I will only address schemes that could be used with existing radios. →

One route that I recommend is binary psk (bpsk)(2 phases) or quaternary psk (qpsk)(4 phases) at a speed that can be sent over the audio channel of an fm or ssb vhf/uhf radio. I have been running a 2400 bits/s bpsk system on a 2400 Hz audio subcarrier through my portable cassette recorder (for computer mass storage) very successfully for several years. The modem easily resides on one hand-wired 5 x 6 inch card. Although the recorder channel probably has somewhat better frequency response than an amateur fm or ssb radio channel, I am hopeful that this scheme will also work over the radio (I have not tried it yet). It might be necessary to reduce the data rate somewhat, however. If we are willing to use a more sophisticated qpsk modem, we might be able to get more than 2400 bits/s through that same audio channel.

Although relatively slow, the above scheme allows easy (audio) interface to any radio. When used with an fm radio, we have the added advantage that no tuning of the audio subcarrier is required. (I am not sure, but the synthesized, channelized ssb rigs may also eliminate the tuning problem). For those willing to custom build modems that can directly psk modulate the oscillator of a transmitter, and then detect the signal directly at some i-f in the receiver (above audio), we could conceivably operate at somewhat higher data rates (and wider bandwidths) with existing multimode vhf/uhf rigs. These interfaces would probably need to be somewhat unique to each different type of radio, so mass production of these is probably not feasible. I would speculate that 4800 to 9600 bits/s in a 10 kHz bandwidth using direct qpsk with this approach is reasonable to expect.

For the satellite channel, we want to keep bandwidths as narrow as possible. So we are left with either direct psk or a psk audio subcarrier on an ssb channel. We should be able to get about 2400 bits/s using bpsk or qpsk over the ssb channel and up to perhaps 4800 bits/s using qpsk and direct (non-audio) interfacing to the radios. (Anyone who is concerned about 100% duty cycle signals on the satellite can be reminded that a psk signal operated at 1/2 the peak power of a 50% duty cycle signal (such as cw or ssb) puts exactly the same average power load on the satellite translator. If AMSAT specifies 400 watts maximum erp, for instance, a psk (or fsk) station need only remember to limit power output to 200 watts erp).

OTHER COMMENTS

While it is true that extremely sophisticated commercial modems exist that can reliably run 9600 bits/s data over a 4 kHz telephone channel, I would hate to try to: (1) buy one of those units ($$$), or (2) duplicate one in my home workshop. I think that it will be a while yet before amateurs get access to such data rates in narrow bandwidths for reasonable expense and complexity.

Although I have not mentioned data coding schemes for error detection or correction in the above discussion, these are also extremely important and will involve similar compromises. The experimenting with coding schemes has just begun, however, so I think that it is too early to lock ourselves into a standard.

REFERENCE

[1]Rinaldo, "Amateur Packet Network Agenda," *proc. of ARRL Amateur Radio Computer Networking Conference,* Vol. 1., October 1981, p.1. □

(Continued from page 1)...

Life members are also requested to update their membership records by filling in the membership form and sending it to Bill. (If you became a Life Member in the last few months and sent Bill a membership form, there's no need to do it again.) The point is that we need current information on Life Members for the membership directory.

When you fill in the membership form, please include a telephone number, even if it is unlisted. We will honor all requests to not list any information in the directory. Also, if you want/expect calls during the day from other AMRAD members, please add your work number some place on the form.

Bill has instituted another worksaver to make the handling of membership cards less of a chore. He is now using his computer to generate confidential information concerning the WD4IWG/R autopatch for the backs of membership cards of licensed members. This is in the form of an adhesive label. Also, he has discontinued sending renewal membership cards unless there is a change in membership status (i.e., going from regular to Life membership, change of call sign, change of name). So, if you're concerned about whether or not we received the renewal, look at the label on the newsletter. There is an escape clause. If you personally want a new membership card, one will be issued to you. Just ask for it when you renew.

BILL PASTERNAK, WA6ITF is taking over HR Report editor's duties effective January 1 from Joe Schroeder, W9JUV. News items for HR Report should now go to Bill Pasternak, 28197 Robin, Saugus, CA 91350, 805-251-7180.

FOR SALE: 300 Hz and 500 Hz filters for Drake TR-7. $40.00 each. W9RI, 4211 7 Ave, Rock Island, IL 61201.

BOB DYRUFF, W6POU sent us a notice about a "Santa Barbara Section Second Annual Digital Data Conference," held on December 26. This is a follow up to the first conference held in January 1981. We'll pass the results along when we get them.

THE DEAF AND THE TTY

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FRUSTRATIONS OF A DEAF COMPUTER HOBBYIST

The AMRAD president and I know of the identity of the subject of this column. But, for obvious reasons, it will be confidential.

Let's say that this deaf computer hobbyist resides in an isolated small town in an underpopulated state. It is about 200 miles away from the largest city in the state where many of his deaf acquaintances reside.

He was hoping to develop a state-wide communications network for the deaf, utilizing state-of-the-art technology in radio and in computers. He read all about the accomplishments that AMRAD had with the Apple II and the TRS-80 in making them function as TDDs. He bought a TRS-80, and after corresponding with AMRAD, set to the task at hand. Only one thing went wrong -- the TRS-80 that he purchased was an updated version and was different from the TRS-80 that AMRAD worked on.

Even though he carried on correspondence with AMRAD, he did not realize that he was working on the "wrong" TRS-80. He attended the TDI convention at Overlank Park, KS in June 1981 and came into contact with me and the AMRAD president. We both explained, obviously to his dismay, that Tandy Corp. had phased out the older TRS-80 model (the one that AMRAD worked on) in favor of a newer model that would comply with the FCC regulations. Though angry and disappointed, he would not give up.

He then befriended a computer hobbyist in his home town, and they both soon came up with a workable TRS-80 TDD, the one that AMRAD "couldn't" solve. Gloating with an "I told you so" attitude, he wrote me a very strong letter denouncing AMRAD for not being of assistance to him.

Anxious to soothe his ruffled feathers, I wrote him, explaining that while AMRAD is one of the nation's foremost organizations of computer, radio and electronic hobbyists, it is only a spare-hours diversion for the members since they have jobs and families to look after and that time is an essence that AMRAD lacks.

Replying with a conciliatory tone, he admitted that his knowledge of technical jargon was weak and his improper choice of words to describe his needs had caused the misunderstanding. He also could not grasp the terminology that AMRAD used in its letters to him. This is a problem common among the deaf people, of which this subject substance is beyond the scope of this article. At any rate, he and AMRAD were communicating on different wavelengths.

To make this story short, while he was elated over his workable TRS-80 TDD, his enthusiasm was tempered by the apathy of the deaf towards his state-wide electronic news service project. He closed it down after several months of use.

If there is a morall -- communications is the name of the game. One would-be TDD manufacturer exhausted two years of his time and his life savings to come up with a TDD. This TDD did not work because it was predicated on the ASCII code! He received wrong advice from a social service agency for the deaf that did not know the difference between ASCII and Baudot.

THE AMATEUR RADIO RESEARCH AND DEVELOPMENT CORPORATION is a technically oriented club of over 500 radio and computer amateurs. It is incorporated in the Commonwealth of Virginia and is recognized by the Internal Revenue Service as a tax-exempt scientific and educational organization.

THE PURPOSES OF THE CLUB are to: develop skills and knowledge in radio and electronic technology; advocate design of experimental equipment and techniques; promote basic and applied research; organize forums and technical symposiums; collect and disseminate technical information; and, provide experimental repeaters.

MEETINGS ARE ON 1st MONDAY of each month at 7:30 p.m. at the Patrick Henry Branch Library, 101 Maple Ave E, Vienna, VA. If the 1st Monday is a holiday, an alternate date will be announced in the *AMRAD Newsletter*. Except for the annual meeting in December, meetings are normally reserved for technical talks - not business.

THE WD4IWG/R REPEATER is an open repeater for data communications (including RTTY), voice and experimental modes. It is located at Tyson's Corner, McLean, VA and has excellent coverage. It features a semi-private autopatch available to licensed members. Frequencies are: 147.81 MHz input, 147.21 MHz output. The head of the technical committee is Jeff Brennan, WB4WLW, 7817 Bristow Dr, Annandale, VA 22003, phone 703-354-8541.

THE AMRAD NEWSLETTER is mailed monthly to members and other clubs on an exchange basis. Technical articles, product announcements, news items, and other copy related to amateur radio and computing are welcom. Honorariums at a rate of $10 per printed page ($20 maximum per author per issue) are paid for original material accepted, Classified ads are free to members. Commercial ad inquiries are invited. The editor reserves the right to reject or edit any portions of the copy. Items should be mailed by the 8th of the preceeding month to Paul L. Rinaldo, W4RI, Editor, 1524 Springvale Ave., McLean, VA 22101, 703-356-8918. Full permission for reprinting or quoting items in the newsletter is granted provided that credit is given to both the author and the newsletter. Mailing to U.S. and possessions is by 3rd Class bulk mail. Canadian/Mexican addresses add $2 for postage. Overseas readers add $8 for air mail or $2.30 for surface.

THE AMRAD MESSAGE SYSTEM is an S-100 Computerized Bulletin Board System on 703-734-1387, system operator Terry Fox, WB4JFI. Terry's home phone number is 703-356-8334. The system accepts 110, 300, 450 and 600 baud ASCII callers using Bell 103-compatible modems.

THE HANDICAPPED EDUCATION EXCHANGE (HEX) is operated by AMRAD for those involved in education and communications for the handicapped. It accepts both 110/300-baud ASCII and deaf TTY callers. on 301-593-7033. The sysop Dick Barth, W3HWN's home phone is 301-681-7372.

AMRAD OFFICERS for 1982 are:

Gerald Adkins, N4GA	Treasurer
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THE AMRAD LIBRARY is operated by Tedd Riggs, KC4YN, 8402 Berea Ct, Vienna, VA 22180, phone 703-573-5067. Donations of technical books, magazines, manuals and catalogs are tax-deductible.

AMRAD IS AFFILIATED with the American Radio Relay League (ARRL), the Foundation for Amateur Radio (FAR), the Northern Virginia Radio Council (NOVARC), and The Mid Atlantic Repeater Council (T-MARC).

SPECIAL INTEREST GROUPS are formed as needed. Currently we have SIGs on Deaf Telecommunications, Spread Spectrum and Packet Radio. If you are interested in joining or forming a SIG, please contact Bill Pala, WB4NFB, 5829 Parakeet Dr, Burke, VA 22015, 703-323-8345.

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